Simulation methods in physics

Homework 4
Return before 13.00 on Tue 18.3., to Ari Hietanen's mailbox (C-wing 3rd floor), or by e-mail ari.hietanen@helsinki.fi

1. Using the single cluster update algorithm of the 2-d Ising model from the previous homework, estimate the **fractal dimension** of the updated cluster at $\beta = \beta_c$. This is done as follows: measure the ratio of the average updated cluster size $|\Lambda|$ to the total volume, using a few volumes up to $L^2 \sim 128^2$, and estimate the value of the exponent $|\Lambda|/V \propto L^x$.

   For each volume, give (plot) $|\Lambda|/V$ with errors; it would be best if you can make a "real" power-law fit to the data, but it is sufficient to just estimate the exponent. Note that the volume may need to be larger than some minimum for the fit to work.

2. Take the $|\Lambda|/V$-data from (about) 32^2 lattice and *reweight* it to a few values in the range $\beta_c \pm 0.1$. Calculate errors with jackknife or bootstrap. Do this also for 64^2. How would you estimate the exponent x to behave as a function of β?